

REMARKS

Claims 1 and 9 have been amended. Attached hereto is a marked-up version of the changes made to the claims by the current amendment. The attached page is captioned "Version with markings to show changes made." Claims 1-3, 6-10, and 12-18 remain pending. Applicant reserves the right to pursue the original claims and other claims in this application and in other applications.

Applicant's representative appreciates the allowance of claims 12-16, as noted in paragraph 7 of the Office Action. While claims 17-18 are not listed as being allowed in paragraph 7 of the September 24, 2001 Office Action (paper 7), as well as paragraph 9 of the April 19, 2002 Office Action (paper 13), these claims are listed among the allowed claims on the PTO-326 forms which accompanied these Office Actions. Applicant's representative again request confirmation of the allowance of claims 17-18 in the body of the next Office Action.

Claims 1-2 and 8-10 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Chahrودي (U.S. Patent No. 5,198,922). Claims 1, 3, and 7-9 stand rejected under 35 U.S.C. § 102(e) as being anticipated by Hansen (U.S. Patent No. 6,081,376). Claims 1-2 and 8-10 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Tedesco (U.S. Patent No. 5,861,990) in view of Chahrودي or Hansen. Claim 6 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Tedesco in view of Chahrودي or Hansen and further in view of Hoch (U.S. Patent No. 6,002,520). These rejections are respectfully traversed.

The present invention is directed at an optical beam homogenizer which includes a transmissive or reflective element having an exterior surface which is irregularly shaped on one side. The irregular shapes are caused by a large plurality of optical elements formed in the surface and are preferably micro wedges having planar output surfaces, such as those illustrated in Fig. 3. Alternatively, the micro wedges may instead feature surfaces which, instead of being planar, include a slight curvature. Specification at page 12, paragraph [0041], first sentence. As illustrated in Fig. 6, and especially in comparison with Fig. 7, even when the micro wedges feature output surfaces which include the slight curvature, the output surfaces have end points consistent with the planar embodiment. Additionally, Figs. 3, 6, and 7 show that the micro wedges are formed from shaping a same substrate material. Accordingly, independent claims 1 and 9 have now been amended to recite the use of “substantially planar” output surfaces which are formed “by shaping a same substrate.”

The optical elements differ in size and shape, so that adjacent elements refract or reflect light in different ways. The collective shapes of the plurality of optical elements may be such that the refracted or reflected light forms a predetermined angular pattern of homogenized light. See Fig. 1, element 18. The present invention utilizes a plurality of differently sized and shaped optical elements formed upon the same substrate to form an homogenized beam of light having a predetermined angular pattern. Significantly, the output surfaces of the optical elements are not textured. Accordingly, independent claims 1 and 9 now also recite that the output surfaces are “non-textured.”

Chahroudi discloses an optical shutter system which features diffuse reflections instead of the specular reflections normally associated with optical shutter systems. See column 1, lines 45-49; column 2, lines 8-21. Chahroudi discloses two embodiments, which are illustrated in Figs. 1-2. Both environments feature a first optical element (2) and a second optical element (3), which surrounds and are separated by an optical shutter element (1). In the embodiment disclosed by Fig. 1, the two optical elements (2, 3) have curved output surfaces while in the embodiment disclosed by Fig. 2, the two optical elements (2, 3) have planar output surfaces.

There are numerous differences between the embodiments disclosed by Chahroudi and the present invention. Claim 1 recites “an irregularly shaped exterior output surface” and claim 9 recites “said optical device including an irregularly shaped exterior output surface.” In Chahroudi, the irregularly shaped output surfaces are located in the interior of the optical device. Claims 1 and 9 further recite that the optical elements are “formed by shaping a same substrate,” however, the optical elements (2, 3) of Chahroudi are not formed from a same substrate because they are non-continuous (i.e., separated by the shutter (1)).

Hansen discloses a reflective optical polarizer. Hansen, at Figs. 5A-5B disclose a polarizer from upon a substrate (47) having an upper surface (48) which has been shaped to form a plurality of planar surfaces. However, Hansen also discloses forming a grid of conductive elements (46), which include a textured upper surface (48). Column 5, lines 55-59. Hansen therefore discloses an optical device having a compound output surface

comprised of planar shaped substrate elements supporting a grid of textured conductive elements.

There are numerous differences between the polarizer of Hansen and the present invention. Claims 1 and 9 recite optical elements which are formed by “shaping a same substrate.” The compound optical elements of Hansen cannot be formed by shaping a same substrate. I.e., in Hansen, the grid of conductive elements which must be attached to the substrate. Additionally, the compound optical elements of Hansen include a complex shape which is also designed to polarize light and cannot be fairly characterized as being “substantially planar,” as required by claims 1 and 9.

Tedesco discloses an optical diffuser and light concentrator. Fig. 1 illustrates the optical device of Tedesco, which includes an output surface including a plurality of projections. Column 3, lines 19-22. The Office Action notes that Tedesco fails to teach the use of planar output surfaces. The Office Action dismisses this feature, however, by stating that it is “merely that of a preferred embodiment and no criticality has been disclosed.” Office Action, page 5. The Office Action further relies upon Fig. 6 to support this conclusion.

Please note that the curved surfaces disclosed in Fig. 6 of the specification are “substantially planar.” That is, the end points of each curved surfaces still correspond to the same end point which would be used in a planar embodiment. Compare, Fig. 6 with Fig. 7. Additionally, while Fig. 6 has been drawn in an exaggerated manner to show the curvature, it should be kept in mind that the specification states that the surfaces

corresponding to Fig. 6 are only slightly curved. Specification, page 12. In contrast, Fig. 1 of Tedesco illustrates highly curved projections which have no apparent relationship to the substantially planar surfaces recited in claims 1 and 9.

The Office Action also offers an alternate theory by stating that Chahroudi or Hansen support the proposition that planar and non-planar surfaces are essentially equivalent and that an artisan would have been motivated by a desire for “improving the optical performance and meeting a particular design” to arrive at the present invention from the teachings of Tedesco and Chahroudi or Hansen. Office Action, page 6. This conclusion overlooks the fact that neither Chahroudi nor Hansen are relevant to either the invention or the system disclosed by Tedesco.

As previously noted, Chahroudi discloses a different type of optical system since it does not have irregular exterior output surfaces and is formed by sandwiching two optical elements between an optical shutter. Similarly, Hansen is directed to a polarizer having a complex compound surface. Indeed, Figs. 10-11 of Hansen, which are cited by the Office Action, are not illustrations of the output surface, but merely illustrations of a portion of the complex textured compound surface. Hansen at column 12, lines 16-35. It is respectfully submitted that an artisan would not have been motivated to combine Tedesco with either Chahroudi or Hansen.

The Office Action additionally cites to Hotch to support the rejection of claim 6, and more specifically, for its teaching of a lens for performing a Fourier transform. Hotch,

however, fails to suggest the features of the present invention missing from the teachings of the other cited prior art.

Claim 1 and 9 each recite an optical system having “an irregularly shaped exterior output surface” formed from optical elements which “have non-textured and substantially planar output surfaces and are formed by shaping a same substrate.” As noted above, the cited prior art is devoid of any teachings or suggestions of these features. Accordingly, claims 1 and 9 are believed to be allowable over the prior art of record. Claims 2-3 and 6-8 (which depend from claim 1), and claim 10 (which depend from claim 9) are believed to be allowable for these reasons and because the combination defined in the claims is taught or suggested by the prior art of record.

Finally, please note that the canceled and/or amended claims have been canceled and/or amended in this case solely for the purpose of furthering the prosecution of the present application. Applicant reserves the right to claim the subject matter of the canceled claims, the claims pending prior to this Amendment, and/or the subject matter of other claims embodied in this application, or any continuation, division, reissue, reexamination or other application. Any amendments made to the application are not made for the purpose of distinguishing the claims over prior art, except as specifically discussed in the Remarks section of this paper.

In view of the above, each of the presently pending claims in this application is believed to be in immediate condition for allowance. And there are additional reasons why the claims should be allowable beyond those mentioned above. Accordingly, the Examiner

is respectfully requested to withdraw the outstanding rejection of the claims and to pass this application to issue.

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Respectfully submitted,

By 

Mark J. Thronson

Registration No.: 33,082

Christopher S. Chow

Registration No.: 46,493

DICKSTEIN SHAPIRO MORIN &

OSHINSKY LLP

2101 L Street NW

Washington, DC 20037-1526

(202) 775-4756

Attorneys for Applicant

Version With Markings to Show Changes Made

Please rewrite claims 1 and 9 as follows:

1. (Amended Three Times) An optical device, comprising:

an irregularly shaped exterior output surface, further comprising,

a first optical element for directing a first portion of an incident light beam in a predetermined first direction; and

a second optical element for directing a second portion of said incident light beam in a predetermined second direction,

wherein

said second direction is different than said first direction,

said second optical element is adjacent said first optical element,

said first optical element is of a first shape, said second optical element is of a second shape, said first shape is different from said second shape, said first and second shapes being microwedges, and

said first optical element and said second optical element have non-textured and substantially planar output surfaces and are formed by shaping [upon] a same substrate.

well shaped

9. (Amended Three Times) An optical system, comprising:

a light source for providing a light beam; and

an optical device for homogenizing said beam, said optical device including an irregularly shaped exterior output surface further comprising,

adjacent optical elements for forming respective non-adjacent portions of an angular pattern,

wherein said optical elements are microwedges formed by shaping [upon] a same substrate and have non-textured and substantially planar output surfaces and different three-dimensional configurations.